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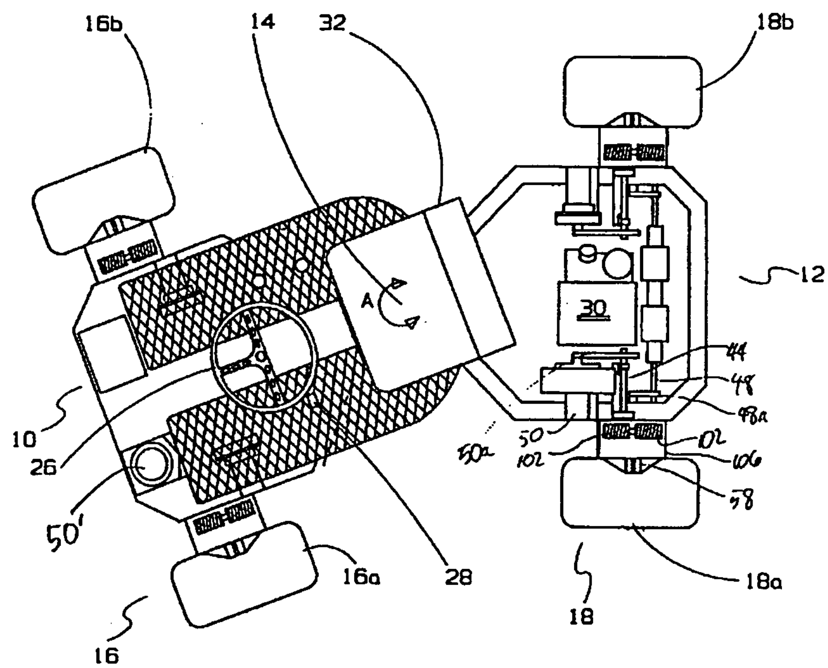
(54) VEHICULE TOUS TERRAINS
(54) ALL TERRAIN VEHICLE



(57) An all terrain vehicle has four wheels mounted at the ends of four corresponding legs. The legs are rotatably mounted at the four corners of the vehicle so that by rotating the legs independently, in vertical or off vertical planes, the wheels may be raised or lowered relative to the vehicle frame. The vehicle frame may be articulated at its center to provide for steering of the vehicle.

Abstract of the Disclosure

An all terrain vehicle has four wheels mounted at the ends of four corresponding legs. The legs are rotatably mounted at the four corners of the vehicle so that by rotating the legs independently, in vertical or off-vertical planes, the wheels may be raised or lowered relative to the vehicle frame. The vehicle frame may be articulated at its center to provide for steering of the vehicle.

ALL TERRAIN VEHICLE

Field of the Invention

This invention relates to the field of all terrain vehicles, and in particular to vehicles adaptable to rolling translation over land, climbing translation over obstacles, floating translation over water, and sliding translation over snow.

Background of the Invention

It is well understood that negotiating difficult terrain often requires specialized vehicles, for example, it is known to provide a hovercraft for the transition from land to water, and vice versa. However, such transportation is not well adapted for negotiating obstacles and requires a large amount of power and is typically of high maintenance. Four wheel drive vehicles are well understood and operate over somewhat rough terrain on land but are not adapted for use on water or in deep snow. Boats and other water craft, whether propeller driven or driven by jet drives, are of course not well adapted for use on land. Other specialized vehicles have also been proposed for use in rough or hostile terrain, for example, that disclosed by Fletcher in United States patent No. 3,730,287 issued May 1, 1973 for a Vehicle for Use in Planetary Exploration.

The planetary exploration vehicle of Fletcher has a frame on which are mounted independently operable propulsion units, each unit including an extending leg coupled to the frame for rotation about a transverse axis. The extended leg is supported by a steerable pedestal having the attributes of a wheel and an endless track. The extended legs may be rotated about the transverse axis to overcome obstacles. The pedestal track may be rotated to translate the frame in the manner of wheeled or tracked translation. What is neither taught nor suggested, and which, without intending to be limiting, is one object of the present invention to provide, is the use of floatation wheels on the end of selectively rotatable legs for high speed overground rolling

translation combined with selectively removable floatation units for over water translation and selectively removable traction drive units and skis for translation over snow. What is also neither taught nor suggested is the use of a center articulated frame for increased manoeuvrability in combination with the selectively rotatable legs.

Summary of the Invention

In summary, the all terrain vehicle of the present invention includes a platform for carrying an operator, the platform having a front frame and a rear frame. The front frame has a first end and an opposite second end. The first end corresponds to a front end of the platform. The rear frame also has a first end and an opposite second end. The second end of the front frame is pivotally mounted to the first end of the rear frame. This allows pivoting of the front frame relative to the rear frame about a vertical frame articulation axis. An articulation drive is mounted to the platform for selective actuating of an articulation linkage mounted between the front and rear frames so as to selectively pivot the front frame relative to the rear frame about the articulation axis.

The front frame has first and second opposite sides. The rear frame also has first and second opposite sides. A first front leg is rotatably mounted to the first side of the front frame. A second front leg is rotatably mounted to the second side of the front frame. A first rear leg is rotatably mounted to the first side of the rear frame. A second rear leg is rotatably mounted to the second side of the rear frame. The front and rear legs are elongate. Each leg has a hub end and an opposite wheel end. Each leg is rotatable about its hub end substantially vertical planes corresponding to each of the legs. The front and rear legs are selectively independently rotatable relative to each other and relative to the front and rear frames by selective actuation of corresponding independent leg rotation drives. The leg rotation drives are mounted to the platform and engage the hub ends of the legs.

First and second front wheels are rotatably mounted to corresponding wheel ends of the first and second front legs. The front wheels rotate in corresponding second planes which are generally parallel to the substantially vertical planes in which the front legs rotate.

First and second rear wheels are rotatably mounted to corresponding wheel ends of the first and second rear legs. The front wheels rotate in corresponding third planes which are generally parallel to the substantially vertical planes in which the front legs rotate. The front and rear wheels are floatation wheels.

At least one wheel drive linkage is mounted to at least one leg of the front and rear legs. Each wheel drive linkage is mounted in driving engagement with a corresponding wheel. A wheel drive is mounted to the platform for selectively actuating each wheel drive linkage so as to selectively drive rotation of the corresponding wheel about a corresponding wheel end.

Advantageously, the frame articulation axis is generally centrally disposed on the platform.

Further advantageously, the articulation linkage is a reduction gear linkage mounted to the front and rear frames. The articulation drive actuating the articulation linkage may be a double acting motor. Actuation of the motor may be by a switch or the like biased by turning of a steering column mounted to the platform. Biasing of the switch causes either rotation of the reduction gears in a first rotational direction so as to articulate the front frame relative to the rear frame in a first direction, or causes rotation of the reduction gears in a second rotational direction, opposite to the first rotational direction, so as to rotate the front frame in a corresponding second direction relative to the rear frame. The double acting motor may be an electric motor. Thus, turning the steering column biases the electric motor by toggling a switch controlling the direction of rotational drive of the electric motor. In one embodiment, not intended to be limiting, the double acting motor is mounted on the front frame along with the steering column and a seat for

the operator. The seat may be mounted on the front frame generally adjacent the second end of the front frame, advantageously on a seat pillar co-axial with the articulation axis.

In one aspect of the present invention, the leg rotation drive are pinion gears mounted on stub drive shafts. The stub drive shafts are rotatably mounted to the platform. The pinion gears mate with corresponding ring gears mounted on the hub ends of the legs. In the preferred embodiment, the ring gears are mounted within a hub housing on the hub ends, and the pinion gears extend into mating engagement within the ring gears so as to engage ring gear teeth spaced around an internal circumference of the ring gears. The hub ends are rotatably mounted on stub axles which extend through, co-axial with, the ring gears.

In one embodiment of the present invention which provides for resilient suspension of the vehicle as it travels, the ring gears are rotatably mounted within the hub housings. The ring gears are free to rotate within a small range of radial travel relative to the hub housings in resiliently biased suspension about a neutral position suspended between opposed resilient biasing means mounted on the hub housings. The resilient biasing means may be a pair of oppositely disposed springs, the springs mounted at their opposite ends to the hub housings. The springs sandwich a flange between their inner adjacent ends. The flange is rigidly mounted to, and protrudes from, the ring gears so as to extend rigidly from the ring gears into the space between the inner adjacent ends of the springs. The flange mass protrude from the ring gears through corresponding slots in the hub housings.

In a further aspect of the invention, the wheel drive linkage is a second drive shaft rotatably mounted to the platform. Alternatively wheel drive linkages are provided to two or more of the wheels. The second drive shaft actuates a chain drive rotatably mounted along the length of the corresponding leg. The chain drive actuates rotation of the corresponding wheel about its wheel stub axle. Advantageously a wheel drive linkage is provided for both the first and second rear legs, and the wheel drive is a motor mounted to the rear frame.

In an embodiment of the present invention capable of over-water travel, the front and rear frames are adapted for mounting corresponding front and rear floatation pods to the undersides of the frames. Mounting means are mounted to the undersides of the front and rear frames so as to releasably mate the floatation pods thereon. When the front and rear legs are selectively rotated so as to position the front and rear wheels generally level with a floatation level of the floatation pods when mounted to the undersides of the front and rear frames, the wheels assist the all terrain vehicle to float stably in the water.

To assist in over-water travel, a propeller drive may be mounted to the platform. A propeller drive linkage is mounted at one end to the propeller drive, and at its opposite end to a rotatably mounted propeller. The propeller drive, which may be a power take-off from the main motor on the rear frame, actuates the propeller drive linkage which in turn rotates the propeller. The propeller may be mounted at one end of an actuable arm, the actual arm rotatably mounted at its other end to the platform. Thus the end of the actuable arm on which the propeller is mounted may be raised and lowered between an elevated position, when use of the propeller is not required, and a lowered position so as to engage the propeller with the water. Advantageously, the propeller drive linkage is mounted along the actuable arm.

In an embodiment of the present invention capable of travel over snow, the front and rear legs can be selectively rotated so as to mount a pair of endless tracks thereon. To install the tracks, the front wheels are rotated into a position disposed rearwardly towards the rear wheels, and the rear wheels are rotated into a position disposed below the rear frame. A first endless track is positioned over the first front wheel and the first rear wheel. A second endless track is positioned over the second front wheel and the second rear wheel. Once so positioned, the front legs are selectively rotated so as to tighten the first and second endless tracks over their respective front and rear wheels.

In this embodiment, a steering ski is releasably mountable to a lower end of the steering column so as to protrude from below said front frame. An articulation drive disabling means is provided. It is selectively actuable so that the operator may disable the articulation drive and thereby rigidly position the front frame relative to the rear frame. Once the articulation drive is disabled, the steering column may be turned to steer the steering ski.

In a further aspect of the present invention, the steering column has a releasably lockable hinge mounted along its length. The hinge is selectively releasable so that the top of the steering column and the steering wheel atop the steering column may be pivoted into a lowered storage position. In addition, the seat is removable for storage or transportation. With the steering column folded down and the seat removed, the vehicle has a vertical height no higher than the height of the tire.

Brief Description of the Drawings

Figure 1 is, in perspective partially cut-away view, the all terrain vehicle of the present invention.

Figure 2 is, in plan view, the all terrain vehicle of the present invention in a left hand articulated turn.

Figure 3 is, in side elevation view, the all terrain vehicle of the present invention approaching an obstacle to be cleared.

Figure 4 is, in exploded perspective view, the wheel drive and articulated leg of the all terrain vehicle of the present invention.

Figure 5 is a partially exploded perspective view of an alternative embodiment of the wheel drive and articulated leg of the all terrain vehicle of the present invention.

Figure 5a is a further partially exploded perspective view of the wheel drive and articulated leg of Figure 5.

Figure 5b is, in partially exploded perspective view, the articulated leg of the forward legs of the all terrain vehicle of the present invention.

Figure 6 is, in enlarged rear perspective view, the wheel drive and leg articulating drive mechanism of the all terrain vehicle of the present invention.

Figure 7 is, in partially cut-away plan view, the steering articulation mechanism of the all terrain vehicle of the present invention.

Figure 7a is, in partially cut-away enlarged view, the lower end of the steering column.

Figure 8 is, in side elevation view, the all terrain vehicle of the present invention in its storage and transportation position having completed self loading onto a pick-up truck bed.

Figure 9 is, in side elevation view, the steering wheel and steering column showing, in dotted outline, the steering wheel in a folded down position for storage.

Figure 10 is, in front elevation view, the all terrain vehicle of the present invention with its port wheels elevated and its starboard wheels generally vertically disposed beneath the vehicle frame for side hill translation.

Figure 11 is, in side elevation view, the all terrain vehicle of the present invention with its detachable flotation pods releasably mounted to the underside of the frame.

Figure 12 is, in rear perspective view, the all terrain vehicle of Figure 11 with its propeller deployed.

Figures 13 is, in left side elevation view, the all terrain vehicle of the present invention in its snow terrain mode.

Figure 14 is, in partially exploded side elevation view, the ski attachment for mounting to the all terrain vehicle of Figure 13.

Detailed Description of Preferred Embodiments

As illustrated in Figures 1-3, the all terrain vehicle of the present invention includes a forward supporting frame 10 pivotally mounted to an aft supporting frame 12 by means of a pin coupling 11. The two frames 10 and 12 overlap across a generally centrally located vertical axis of articulated rotation 14 of forward supporting frame 10 relative to aft supporting frame 12. Pin coupling 11 lies on axis 14. Thus, the forward and aft supporting frames form a complete vehicle frame. The vehicle frame is articulated in the middle about axis 14 for steering of forward floatation wheels 16a and 16b relative to aft floatation wheels 18a and 18b, that is, by rotation of forward frame 10 in direction A relative to aft frame 12.

The forward and aft floatation wheels are each mounted on a corresponding leg, for ease of reference numbered 20a and 20b to correspond to forward floatation wheels 16a and 16b, and 22a and 22b to correspond to aft floatation wheels 18a and 18b. Forward supporting frame 10 has mounted thereon steering wheel column and steering wheel 24 and 26 respectively. Driving controls 28 and mounted on forward frame 10, such as for example, and for illustrative

purposes only, may be found in conventional vehicles, in particular brake and throttle pedals. Driving controls 28 are cooperatively connected via cable linkages or other means known in the art to at least one main propulsive unit or prime mover 30 which may be one or more gasoline powered reciprocating engines or the like known in the art mounted on to aft supporting frame 12. An operator's seat 32 may be mounted to forward supporting frame 10, conveniently so as to position an operator in proximity to vertical articulating axis 14.

Legs 20a and 20b are pivotally mounted on opposite lateral sides of forward supporting frame 10. Legs 22a and 22b are pivotally mounted on opposite lateral sides of aft supporting frame 12. Each leg is selectively rotatable about a corresponding stub shaft, the laterally outermost ends of which numbered for ease of reference 34a, 34b, and 36a and 36b respectively. Each of the aft legs contain the same structure, shown representatively with respect to leg 22a in Figure 4. Leg 22b is a mirror image of leg 22a. The laterally outermost ends of the stub shafts are contained within corresponding bearing housings 37. Advantageously, in one preferred embodiment as seen in Figure 4, the end of the stub shaft contained within bearing housing 37 is a stepped shaft rotatably encased between laterally opposed sets of roller bearings 39 laterally spaced apart sufficiently so that a radially enlarged stepped portion (36a' in Figure 4) of the shaft is held between the laterally spaced apart sets of roller bearings 39 within bearing housing 37.

The legs may thus be rotated about transverse axis of rotation 38 corresponding to forward legs 20a and 20b, and transverse axis of rotation 40 corresponding to aft legs 22a and 22b. The forward legs may be rotated about transverse axis of rotation 38 in direction B so as to rotate the wheels from their storage positions (shown in dotted outline) to a lowered drive position. Similarly, the aft legs may be rotated in direction C about transverse axis of rotation 40.

As seen in Figures 4, 5 and 5a, rotation of the legs in direction B or in direction C is selectively actuated by means of a pinion gear 42 in each leg mounted on a corresponding

pinion gear shaft 44. Pinion gear 42 engages ring gear 46 mounted to the laterally inner side of the corresponding leg. As better described below, ring gear 46 is fitted into the inner side of housing 106 on a corresponding leg and held in place by a retainer ring 108. Ring gear 46 can rotate relative to housing 106 approximately 1 1/2 inches either side of a resiliently centered position against the return biasing force of coil springs 102 to give the wheels a corresponding six to eight inches resilient travel either way for a spring cushion effect. Pinion gear 42 engages ring gear 46 in toothed engagement so that rotation of pinion gear shaft 44 rotates the corresponding leg about its corresponding transverse axis of rotation 38 or 40. Pinion gear shafts 44 may be driven by corresponding electric motors such as 12 volt Warner™ winch motors 50, one motor for each leg, such as seen in Figure 6. Motors 50 rotate gear shafts 44 via drive chains 50a and gears 50b.

Aft floatation wheels 18a and 18b may be selectively driven by means of drive sprocket 52 rigidly mounted to corresponding stub axle drive shaft 36a or 36b driving drive chain 54. Prime mover or propulsive unit 30 drives drive shaft 48. Drive shaft 48 rotates drive chain 48a, which rotates the stub axle drive shaft 36a or 36b. Drive chain 54 engages, at the radially distal ends of the legs illustrated by way of example as leg 22a, wheel drive sprocket 56 rigidly mounted to corresponding stub axle 58. Corresponding floatation wheels 18a or 18b are rigidly mounted on the opposite end of stub axle 58 so that rotation of wheel drive sprocket 56 by drive chain 54 rotates stub axle 58 and the corresponding floatation wheel to thereby provide rolling traction for rolling translation of the vehicle. Chain 54 may be provided with spring biased chain tensioner arm 54a (seen in Figures 5 and 5a). It is understood that it is within the scope of the invention that forward wheels 16 also provide drive traction in a fashion similar to the aft wheels. However, in the embodiment illustrated, forward wheels 16 are not drive wheels and thus, as in Figure 5b, leg 20a does not contain drive sprockets 52 or 56 and drive chain 54. Leg 20b is a mirror image.

Forward legs 20 and aft legs 22 may be provided with suspension 100. Suspension springs 102 are mounted in opposed orientation on either side of a spring mount 104 rigidly mounted to ring gear 46. With ring gear 46 snugly journalled within ring gear housing 106 and rotatably mounted therein by means of retainer ring 108 mounted to ring gear housing 106. Retainer ring 108 may be either a machine fit as seen in Figures 5 and 5a, or may be mounted mounted by means of flanges 108a cooperating with bolt holes 106 a on housing 106.

Spring mount 104 is slidably mounted within slot 110. With spring mount 104 slidably mounted within slot 110 in ring gear housing 106. The distal ends of springs 102 engage stops 112 rigidly mounted to ring gear 106. Assembly of ring gear 46 into ring gear housing 106 is facilitated by aperture 114 in slot 110. With ring gear 46 rotatably mounted within ring gear housing 106 so that spring mount 104 is free to slide within slot 110, relative rotational movement of leg 22 (leg 22a being illustrated) about stub shaft 36 (stub shaft 36a being illustrated) relative to ring gear 46, causes compression of one of the pair of springs 102 against the corresponding stop 112. Thus small relative movement is resiliently provided for as spring mount 104 slides within slot 110.

Steering of the vehicle, as described above, is accomplished by articulating front frame 10 relative to aft frame 12 about axis 14. As seen in Figures 7, 7a and 8, this may be accomplished by providing a separate winch 50' articulating, through reduction gearing, the selective rotation of frame 10 about pin coupling 11. Winch 50' is a two-way winch which, in one embodiment, is actuated by rotation of steering column 24. Steering wheel 26 is mounted rigidly to the top of steering column 24. Turning steering wheel 26, rotates steering column in direction E. Lever arm 116 located generally adjacent the bottom most end of steering column 24, is rigidly mounted to steering column 24 so as to rigidly support a yolk 118. Rotation of steering column 24 in direction E translates yolk 118 in direction F or F' (depending on which side of center the steering column is turned to) a small distance sufficient to trigger switch actuating lever 120. Switch actuating lever 120 is electrically connected to winch 50' so as to activate the winch. A

left hand rotation of steering wheel 26, causes a commensurate displacement in direction F' of yolk 118 and a commensurate displacement in a similar direction then of switch actuating lever 120. This causes winch 50' to turn belt 122 in direction G which turns oversized pulley wheel 124. Pulley wheel 124 and reduction pulley 128 are rigidly mounted on a common shaft 126. Pulley wheel 124 is rigidly mounted to shaft 126 by means of hub 124a and spokes 124b. Thus turning pulley wheel 124 also turns reduction pulley 128. Rotation of belt 122 in direction G thus also rotates belt 130 in direction G'. Rotation of belt 130 causes rotation of forward frame 10 about pin coupling 11 as belt 130 turns around fixed pulley 132 rigidly mounted to shaft 11.

Turning of steering column 24 is resiliently biased to a centered position by means of opposed pair of springs 134 mounted to lever arm 116. Springs 134 urge the steering column and wheel to a normally centered position and so also resiliently bias yolk 118 to a centered position wherein switch actuating lever 120 is in its non-actuating position.

The vehicle of the present invention may overcome, that is, ride over, obstacles such as log 8 or may self load in the back of a conventional pickup truck (not shown). Firstly, the frame 10 is elevated to its full vertical height as seen in Figure 3, by selectively rotating the legs to the vertical position. This allows the placement of forward lip 10a of supporting frame 10 onto the obstacle. Forward legs 20a and 20b are then rotated upwardly from the vertical in direction B', so as to rotate wheels 16a and 16b from the vertical lowered position to an elevated position such as used to stow the wheels after the vehicle has self-loaded into the back of a pickup truck. Continuing rotation of the forward wheels in direction B' rotates the wheels over the obstacle. Rotation of the forward legs is continued until the wheels are placed onto the far side of the obstacle, that is the side of the obstacle opposite the vehicle and operator sitting in seat 32.

Thus, in order to ride over log 8, wheels 16 are rotated over the top of the obstacle in direction B', then forwardly and downwardly in direction B until they recontact the ground surface 62 on the far side of log 8 thereby allowing the vehicle to proceed with forward rolling

translation in direction D until the aft wheels also contact log 8. The aft wheels are then cleared over the log in the same manner employed for the forward wheels. That is, with the aft legs adjacent log 8, aft supporting frame 12 is lowered onto the log by rotating aft legs 22a and 22b in direction C'. With aft supporting frame 12 resting on the log, the rotation of the aft legs is continued in direction C to thereby rotate the aft wheels over the log until they also contact ground surface 62 so as to thereby be on the same side of the log as the forward wheels. Continued rotation of aft legs 22 in direction C then elevates aft supporting frame 12 up off the log to allow the vehicle to continue its rolling translation in direction D.

With respect to the self-loading of the vehicle of the present invention into the back of a pickup truck, initially lip 10a is placed onto the surface of the lowered tailgate of the truck. The front wheels are then rotated in direction B' as if clearing over an obstacle. The forward wheels are rotated forwardly and downwardly, i.e. in direction B, until they contact the bed of the pickup truck. Continued rotation of the forward legs lifts lip 10a and the nose of forward supporting frame 10 off the tailgate of pickup truck so that the vehicle may be rolled forward by actuation of the rear drive wheels in direction D until the aft legs contact the tailgate. The forward wheels are then retracted by rotation of the forward legs counter to direction B into their position shown in Figure 8. Aft supporting frame 12 is then lowered onto the tailgate by rotation of the aft legs in direction C'. Continued rotation of the aft legs 22 in direction C' rotates the aft wheels until they are rotated forwardly into their position as illustrated in Figure 8, that is, into the confines of the box (shown in dotted outline) of the pickup truck. Steering column may fold down in direction E about the hinge line of hinged plates 64 as better seen in Figure 9 for storage. By removing two bolts (not shown) from hinged plates 64, the steering column collapses into its storage position. This is then the storage mode of the vehicle in the back of the pickup truck, ready for transportation.

As illustrated in Figure 10, selective rotation of the legs on one side of the vehicle allows for rolling translation of the vehicle transversely across a steep side hill or inclined slope,

such as up to an approximately 45 degree slope, while still maintaining the fore and aft supporting frames generally horizontal and the vehicle operator in a generally normal operating position.

As better seen in Figure 11, fore and aft floatation pods 66 and 68 respectively, may be releasably coupled by means of bolts or the like, to the undersides respectively of forward supporting frame 10 and aft supporting frame 12. Advantageously, the floatation pods are shaped in plan view to correspond in shape to the undersides of the corresponding supporting frames. The floatation pods assist in floatation of the vehicle for water transportation. The pods may be rigid or may be inflatable. In Figure 11, the floatation pods have been releasably mounted to the undersides of the supporting frames and the floatation wheels elevated into a generally elevated position wherein the fore and aft legs are generally horizontally co-planar with the fore and aft supporting frames. This places the floatation wheels in generally co-planar relation with the floatation pods so that upon entry into the water, floatation of the vehicle is buoyant, not only on the floatation pods, but also assisted by buoyant displacement by the floatation wheels. A manually deployable propeller drive shaft 70 may be rotated from a generally horizontal position to the downwardly disposed position illustrated so as to submerge propeller 72. Propeller 72 may be selectively engaged by engaging a power take-off (not shown) for rotation of the propeller by means of main propulsive unit 30. The propeller may be selectively engaged as for example by means of an electric clutch (not shown), as would be understood by a person skilled in the art.

The illustrated embodiment is two wheel rear driven. A hydrostatic transmission and a posi-traction rear end provides drive to both rear wheels at all times. The two flotation units, complete with rudders (not shown) can be mounted simply by moving front wheels forward from their lowered position and rear wheels backward from their lowered position so as to lower the frame onto pins (not shown) protruding upwardly from the flotation pods. The pins slide through mating holes in the frame and are secured with lock pins. The device is steered in water, the same as on land, by electric articulation of the fore frame 10 relative to the aft frame 12. Articulation turns the rudders along with the flotation pods.

For use in a snow covered environment, in a third terrain capability, as better seen in Figure 13, a ski attachment 74 such as better seen in Figure 14, is mounted onto, and below, the steering column. The upper end of ski 74 is an internally or externally splined shaft which is journalled onto or into a corresponding mating splined shaft or aperture on or in the lower end of the steering column, into steering engagement therewith so that turning the steering wheel about axis G turns not only the steering column but also rotates the ski attachment for steering of the vehicle in its snow terrain mode. Removing a bolt disengages the electric steering. the electric steering is disengaged by an electrical switch or manually disengaged or otherwise, thereby locking the frame in a rigid position, with frame 10 fixed in position relative to frame 12. In one embodiment, the frame cannot articulate because the reduction drive is held rigidly. The splined ski shaft is then be slid into engagement with the steering column. Ski 74 is manually steered. Forward wheels 16 are rotated rearwardly and upwardly into the position illustrated in Figure 13 so as to raise forward wheels 16 above the snow terrain level. Traction chains or similar devices such as plastic traction chains 76 as illustrated, may then be placed over both fore and aft wheels 16 and 18 and the chains tensioned by selective rotation of the forward wheel on forward legs 20. Alternatively, traction chains 76 may be tensioned by selective rotation of aft legs 22. With traction chains 76 tensioned, drive power applied to aft wheels 18 rotates traction chains 76 about aft wheels 18 and forward wheels 16. Forward wheels 16 act as idlers. Traction chains 76 then provide for traction translation of the vehicle resting on ski 74 in a forward motion over snow.

As will be apparent to those skilled in the art in the light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.

WHAT IS CLAIMED IS:

1. An all terrain vehicle comprising:

a platform for carrying an operator, said platform having a front frame and a rear frame,

said front frame having a first end and an opposite second end, said first end corresponding to a front end of said platform,

said rear frame having a first end and an opposite second end,

said second end of said front frame pivotally mounted to said first end of said rear frame for pivoting of said front frame relative to said rear frame about a vertical frame articulation axis, an articulation drive mounted to said platform for selective actuating of an articulation linkage mounted between said front and rear frames so as to selectively pivot said front frame relative to said rear frame about said articulation axis,

said front frame having first and second opposite sides, said rear frame having first and second opposite sides,

a first front leg rotatably mounted to said first side of said front frame,

a second front leg rotatably mounted to said second side of said front frame,

a first rear leg rotatably mounted to said first side of said rear frame,

a second rear leg rotatably mounted to said second side of said rear frame,

said front and rear legs elongate, each having a hub end and an opposite wheel end and each rotatable about its hub end in corresponding substantially vertical planes,

said front and rear legs selectively independently rotatable relative to each other and relative to said front and rear frames by selective actuation of corresponding independent leg rotation drives mounted to said platform and engaging said hub ends,

first and second front wheels rotatably mounted to corresponding wheel ends of said first and second front legs for rotation in corresponding second planes generally parallel to said substantially vertical planes,

first and second rear wheels rotatably mounted to corresponding wheel ends of said first and second rear legs for rotation in corresponding third planes generally parallel to said substantially vertical planes,

at least one wheel drive linkage mounted to at least one of said front and rear legs, said at least one wheel drive linkage in driving engagement with a corresponding wheel of said front and rear wheels,

a wheel drive mounted to said platform for selectively actuating said at least one wheel drive linkage so as to selectively drive rotation of said corresponding wheel about a corresponding said wheel end,

wherein said front and rear wheels are floatation wheels.

2. The apparatus of claim 1 wherein said frame articulation axis is generally centrally disposed on said platform.

3. The apparatus of claim 1 wherein said articulation linkage is a reduction gear linkage mounted to said front and rear frames.

4. The apparatus of claim 3 wherein said articulation drive is a double acting motor biased by turning of a steering column mounted to said platform between rotation of said reduction gears in a first rotational direction so as to articulate said front frame relative to said rear frame in a first direction, and a second rotational direction opposite to said first rotational direction so as to rotate said front frame in a corresponding second direction relative to said rear frame.

5. The apparatus of claim 4 wherein said motor is an electric motor and said steering column biases said electric motor by toggling a switch controlling the direction of rotational drive of said electric motor.

6. The apparatus of claim 4 wherein said motor is mounted on said front frame and said steering column is mounted on said front frame and wherein a seat for said operator is mounted on said front frame generally adjacent said second end of said front frame.

7. The apparatus of claim 1 wherein said leg rotation drive are pinion gears mounted on stub drive shafts, said stub drive shafts rotatably mounted to said platform, said pinion gears mating with corresponding ring gears mounted on said hub ends.

8. The apparatus of claim 7 wherein said ring gears are mounted within a hub housing on said hub ends and wherein said pinion gears extend into said ring gears so as to engage ring gear teeth around an internal circumference of said ring gears.

9. The apparatus of claim 7 wherein said hub ends are rotatably mounted on stub axles.

10. The apparatus of claim 7 wherein said ring gears are rotatably mounted within said hub housings in resiliently biased suspension about a neutral position suspended between opposed resilient biasing means mounted on said hub housings.

11. The apparatus of claim 10 wherein said resilient biasing means are a pair of oppositely disposed springs mounted at their opposite ends to said hub housings, said springs sandwiching therebetween a flange rigidly mounted to, and protruding from, said ring gears.

12. The apparatus of claim 11 wherein said flange protrudes from said ring gears through corresponding slots in said hub housings.

13. The apparatus of claim 1 wherein said at least one wheel drive linkage is a second drive shaft rotatably mounted to said platform, said drive shaft actuating a chain drive rotatably mounted along the length of said at least one of said front and rear legs, said chain drive actuating rotation of a corresponding wheel.

14. The apparatus of claim 13 wherein said at least one of said front and rear legs are said first and second rear legs and said wheel drive is a motor mounted to said rear frame.

15. The apparatus of claim 1 wherein said front and rear frames are adapted for mounting corresponding front and rear floatation pods to underside mounting means mounted to undersides of said front and rear frames, wherein, when said front and rear legs are selectively rotated so as to position said front and rear wheels generally level with a floatation level of said floatation pods when mounted to said undersides of said front and rear frames, said all terrain vehicle will float in water.

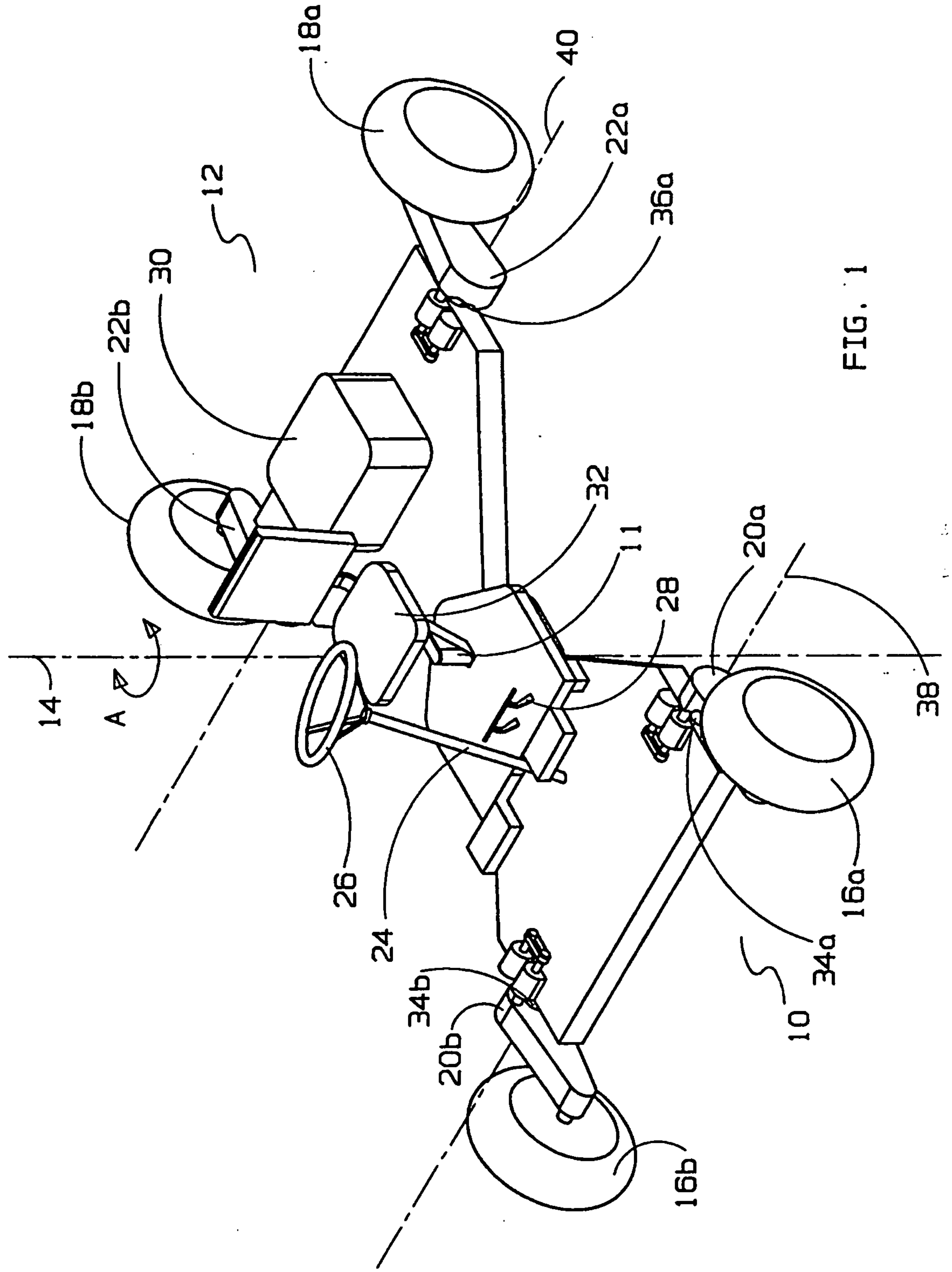
16. The apparatus of claim 15 further comprising a propeller drive mounted to said platform, a propeller drive linkage mounted at one end to said propeller drive, and at its opposite end to a rotatably mounted propeller.

17. The apparatus of claim 16 wherein said propeller is mounted at one end of an actuable arm, said actual arm rotatably mounted at its other end to said platform so as to be actuable between an elevated position when use of said propeller is not required, and a lowered position so as to engage said propeller with said water, said propeller drive linkage acting along said actuable arm.

18. The apparatus of claim 1 wherein said front and rear legs can be selectively rotated so as to rotate front wheels into a position disposed rearwardly towards said rear wheels, and said rear wheels disposed below said rear frame so as to accept a first endless track positioned over said first front wheel and said first rear wheel, and so as to accept a second endless track positioned over said second front rear wheel and said second rear wheel, wherein once so positioned, said front legs may be selectively rotated so as to tighten said first and second endless tracks over their respective corresponding front and rear wheels.

19. The apparatus of claim 18 further comprising a steering ski releasably mountable to a lower end of said steering column, and further comprising articulation drive disabling means selectively actuable so as to disable said articulation drive and rigidly position said front frame relative to said rear frame, and wherein, when said articulation drive is so disabled, said steering column may be turned to steer said steering ski, said steering ski protruding from below said front frame.

20. The apparatus of claim 4 wherein said steering column has a releasably lockable hinge mounted along its length, said hinge selectively releasable so as to pivot a steering wheel atop said steering column into a lowered storage position.



18a
40
22a
36a
12
30
22b
18b
32
11
28
20a
38
14
A
26
24
16a
34a
10
34b
20b
16b

FIG. 1

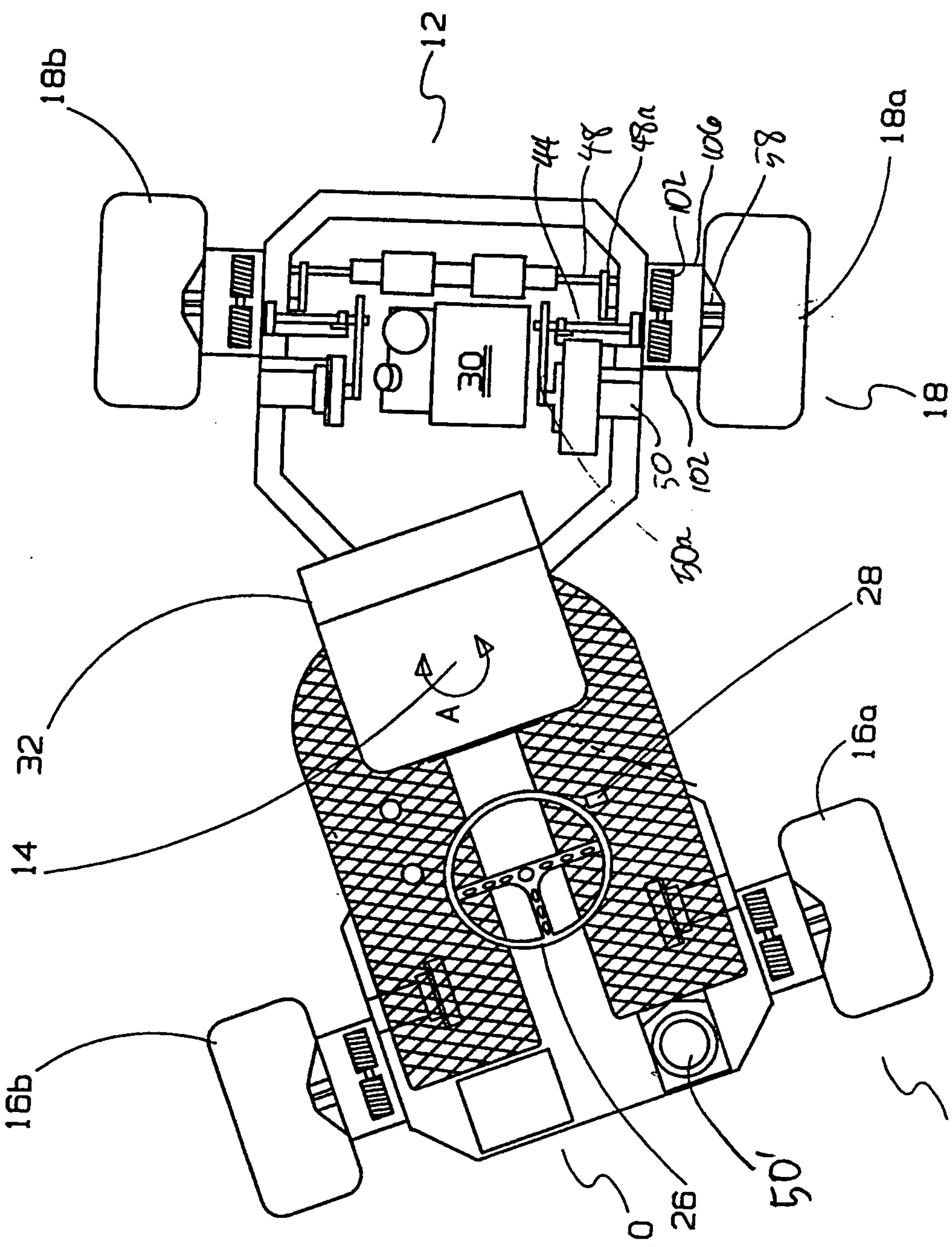

12
18b
18a
44
48
48a
102
106
98
30
50
102
18
50a
28
32
A
14
16a
16b
16
10
26
50'

FIG. 2

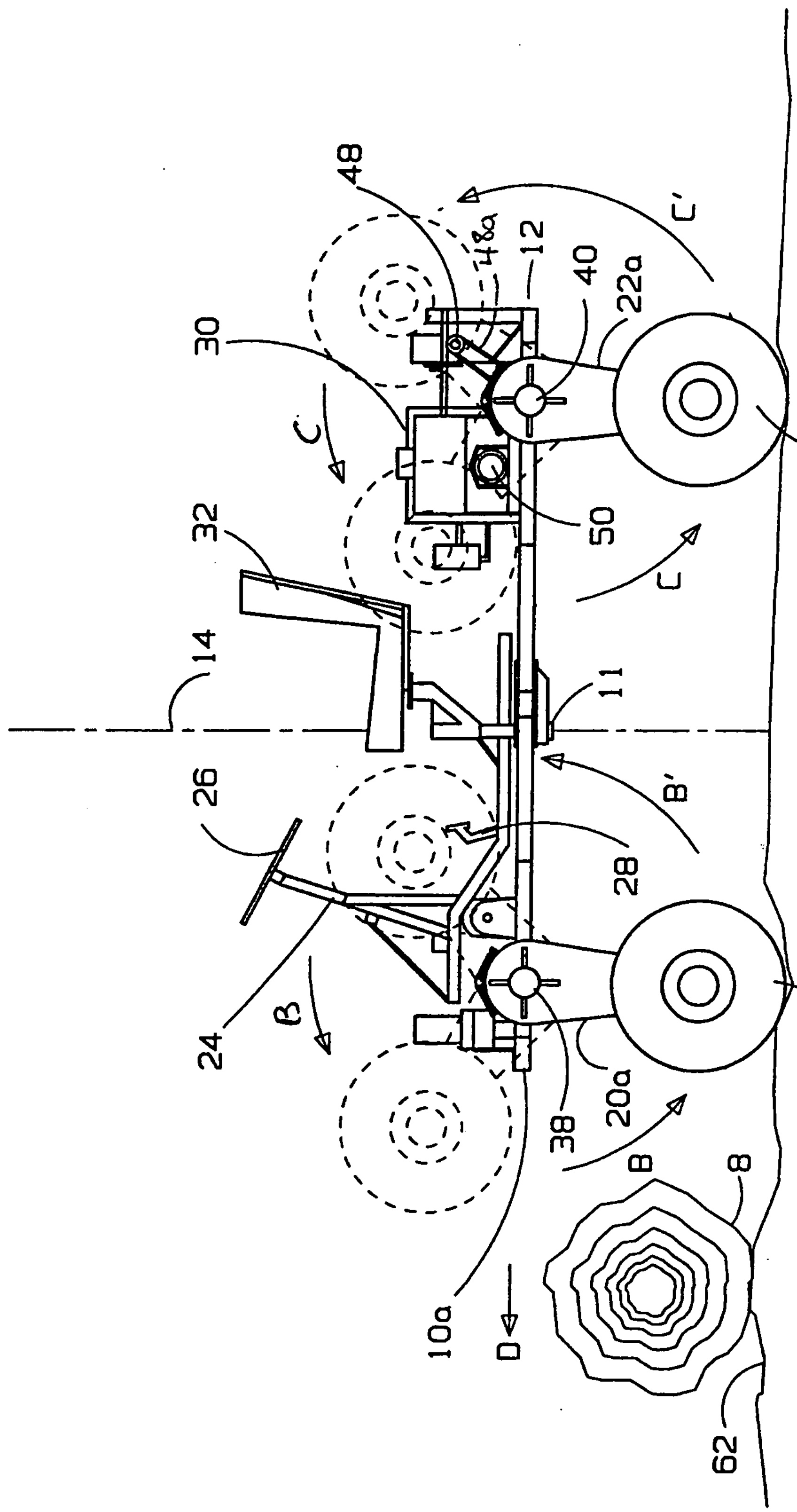

48
48a
12
40
22a
C'
30
C
32
50
18a
C'
14
11
B'
26
28
24
B
38
20a
16a
B
8
10a
D
62

FIG 3

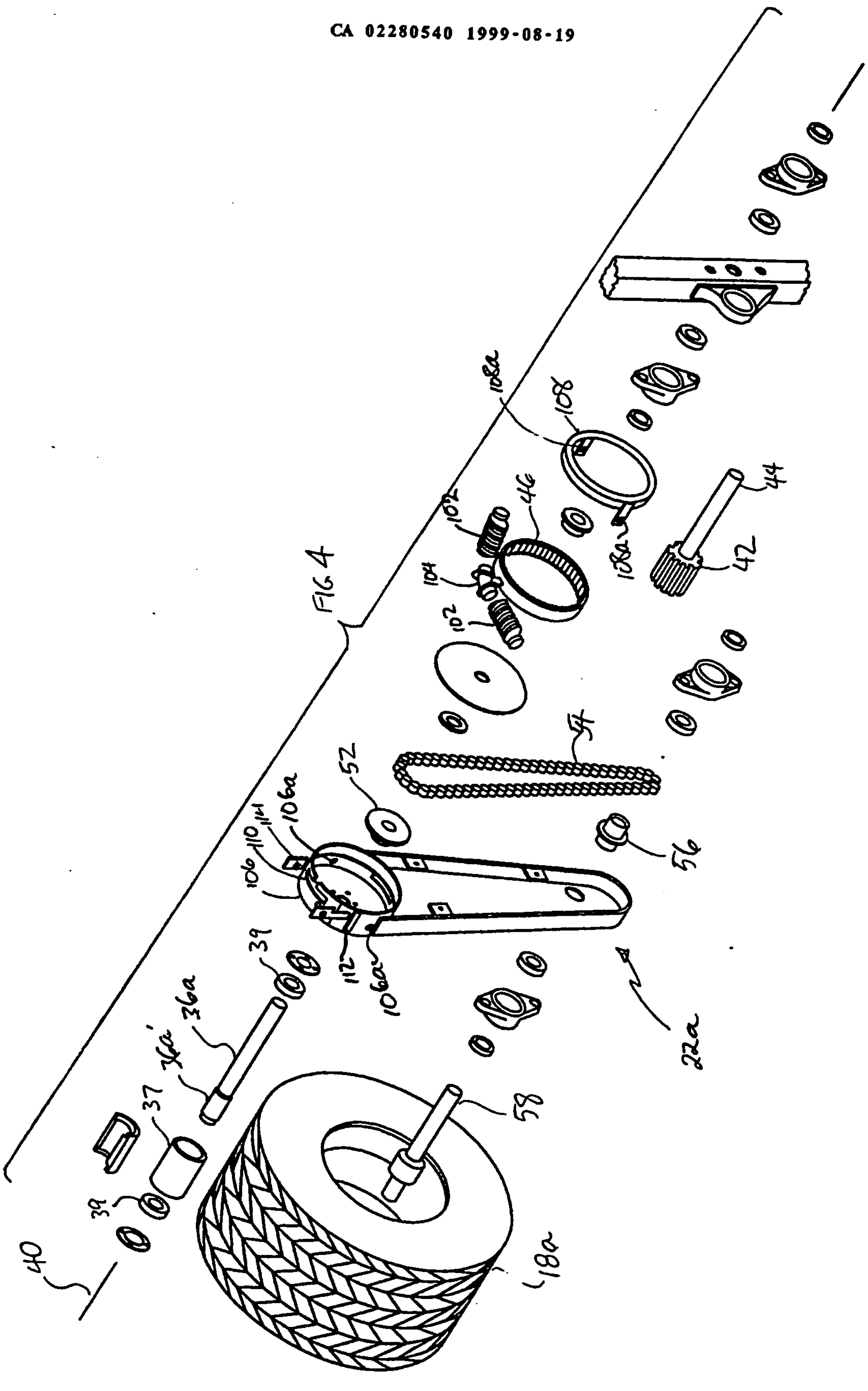
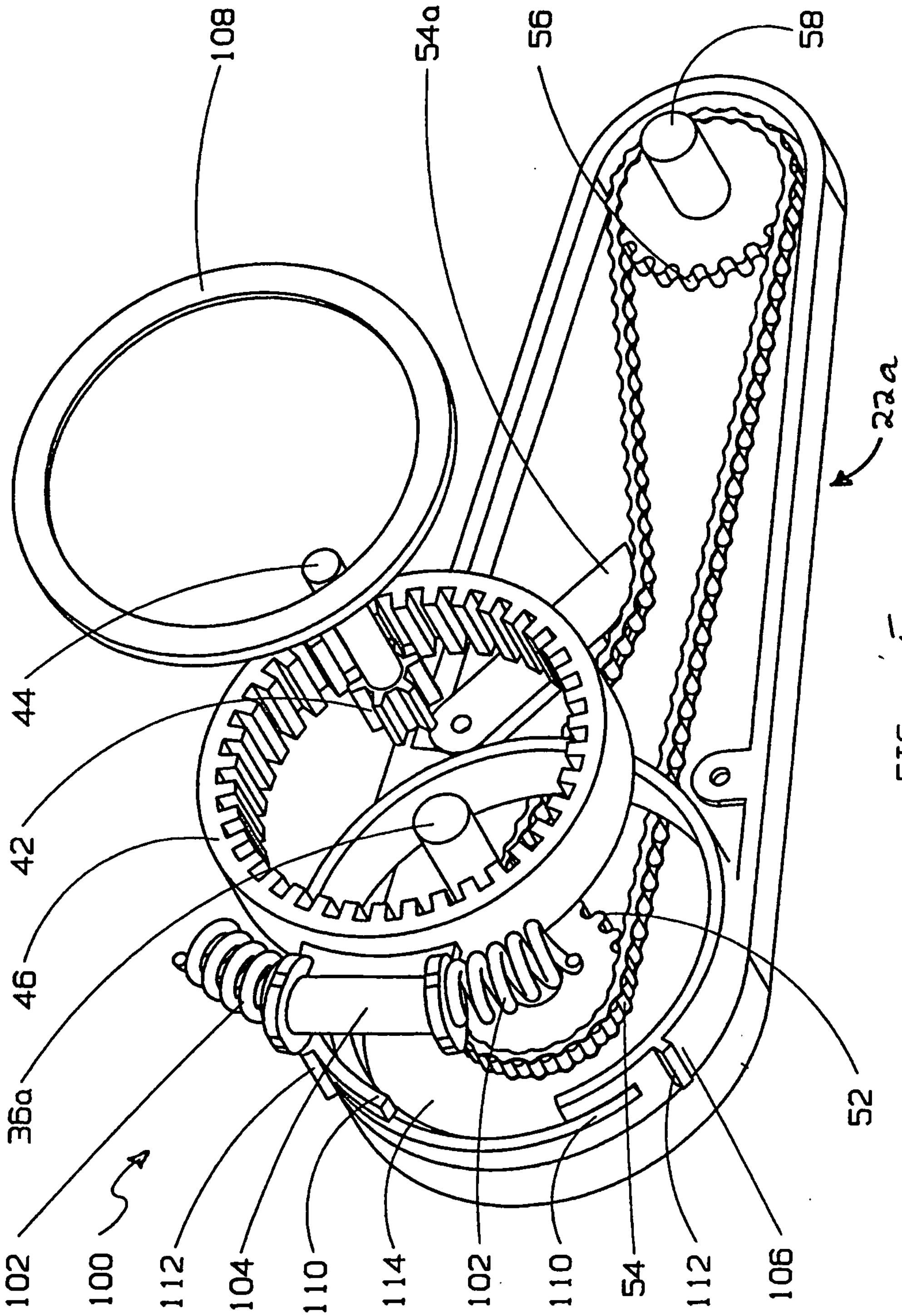

40
39
37
36a'
36a
39
18a
58
112
106a
106
110
114
106a
52
22a
54
56
102
104
102
46
108a
108
108a
42
44

FIG 4


108
54a
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42
46
36a
52
102
100
112
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110
114
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110
54
112
106

FIG. 5

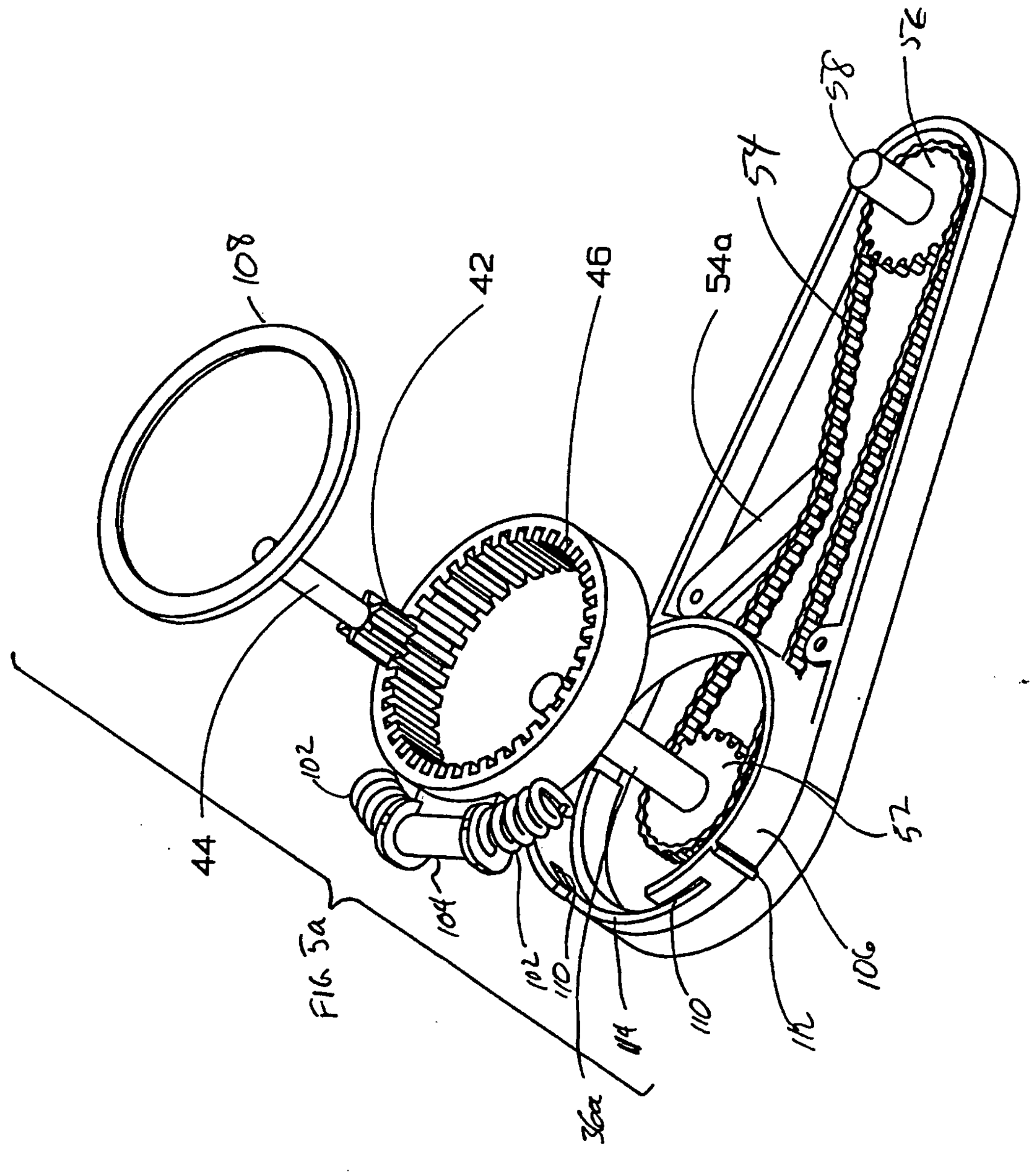


FIG 3a

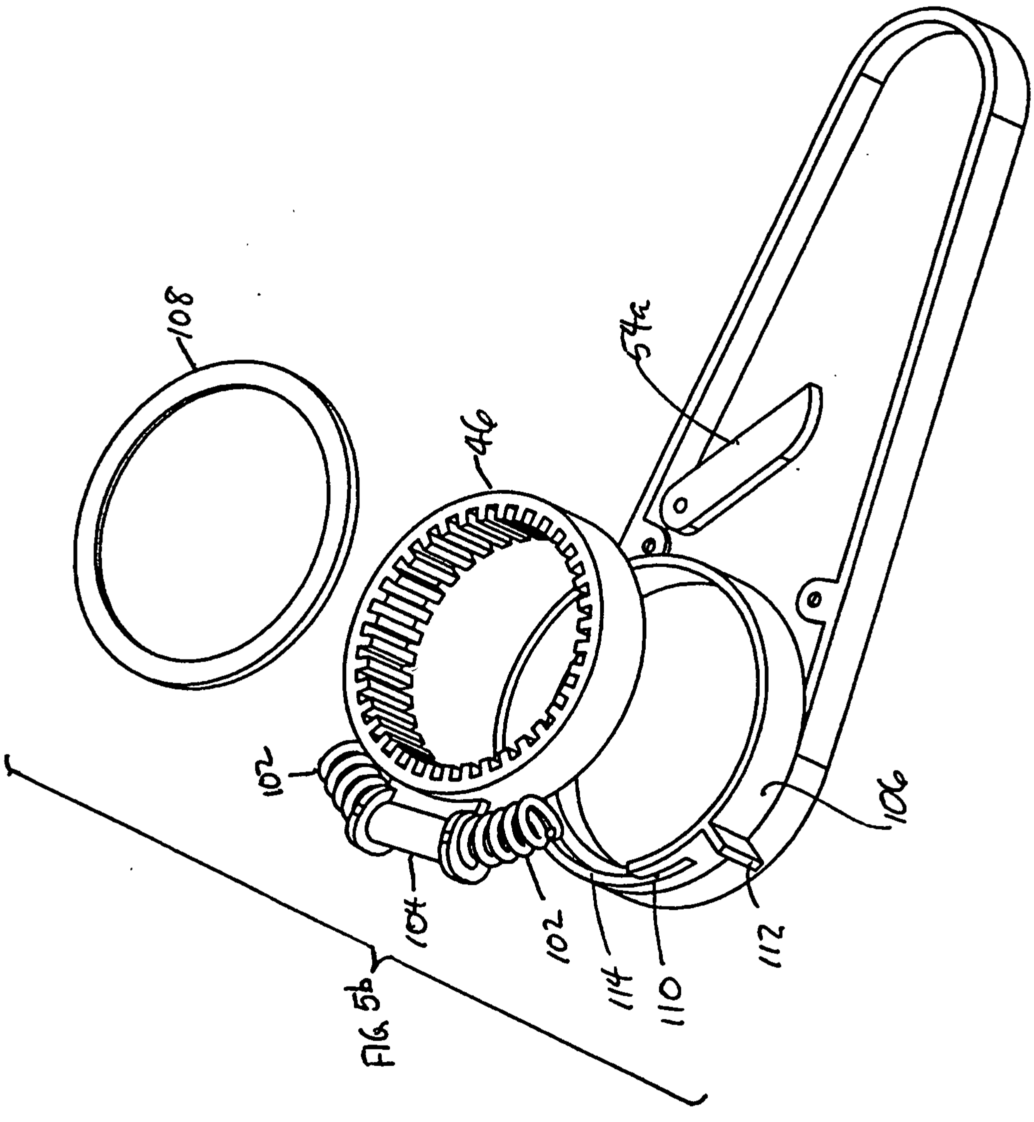


FIG. 5b

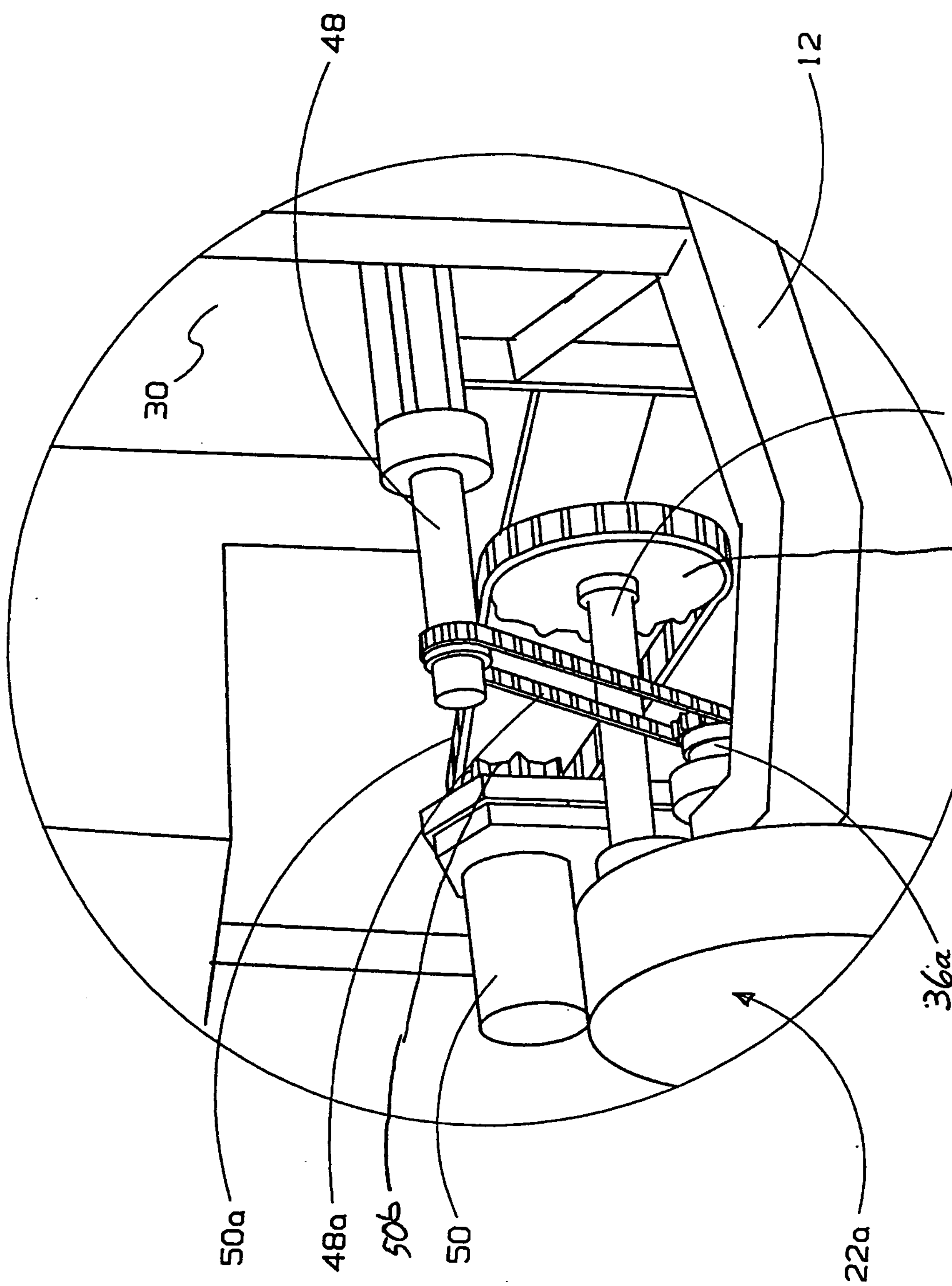
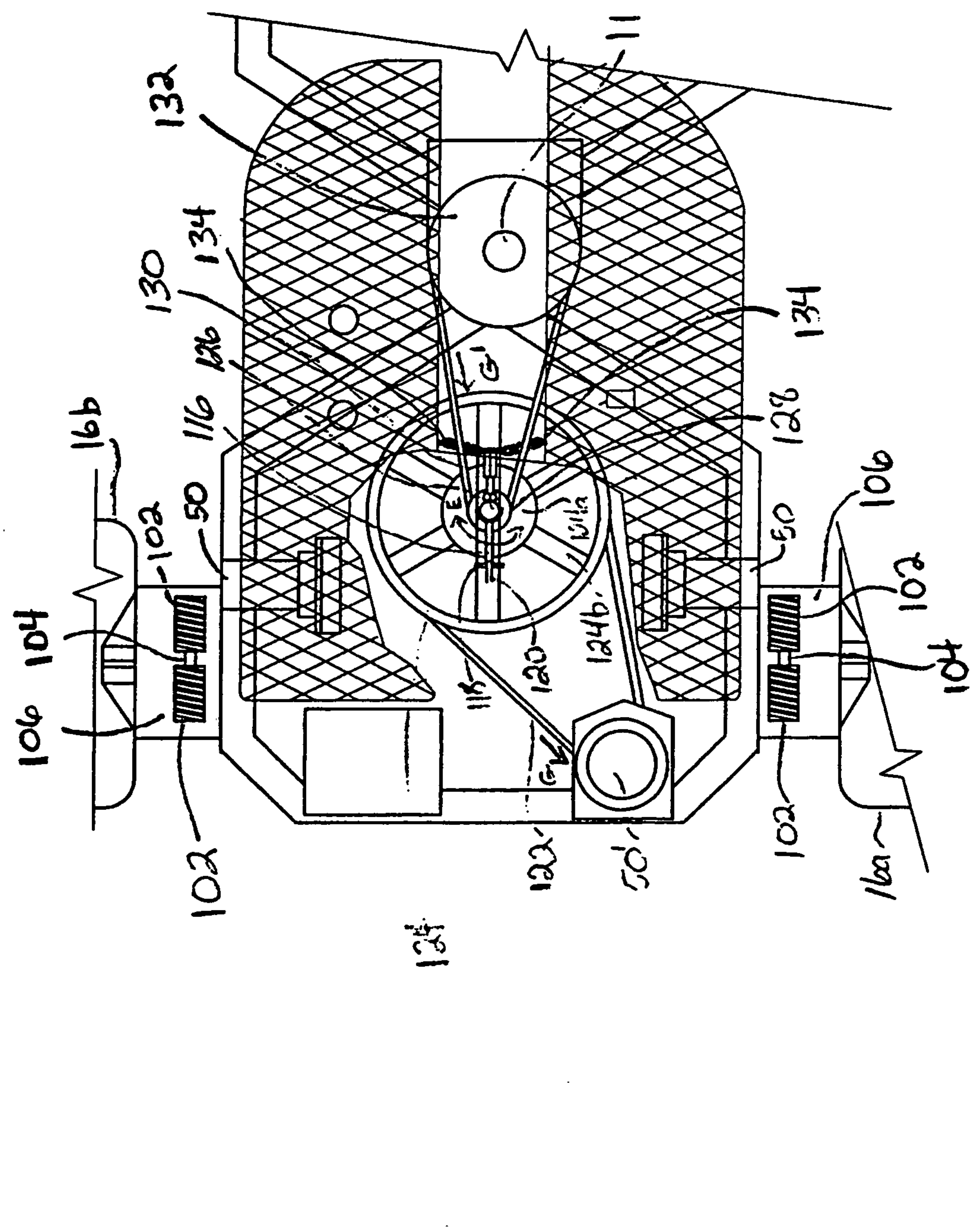


FIG. 6


132
11
134
130
134
126
116
128
16b
102
50
50
106
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102
102
104
106
102
118
120
124b
122
50'
16a
134

FIG. 7

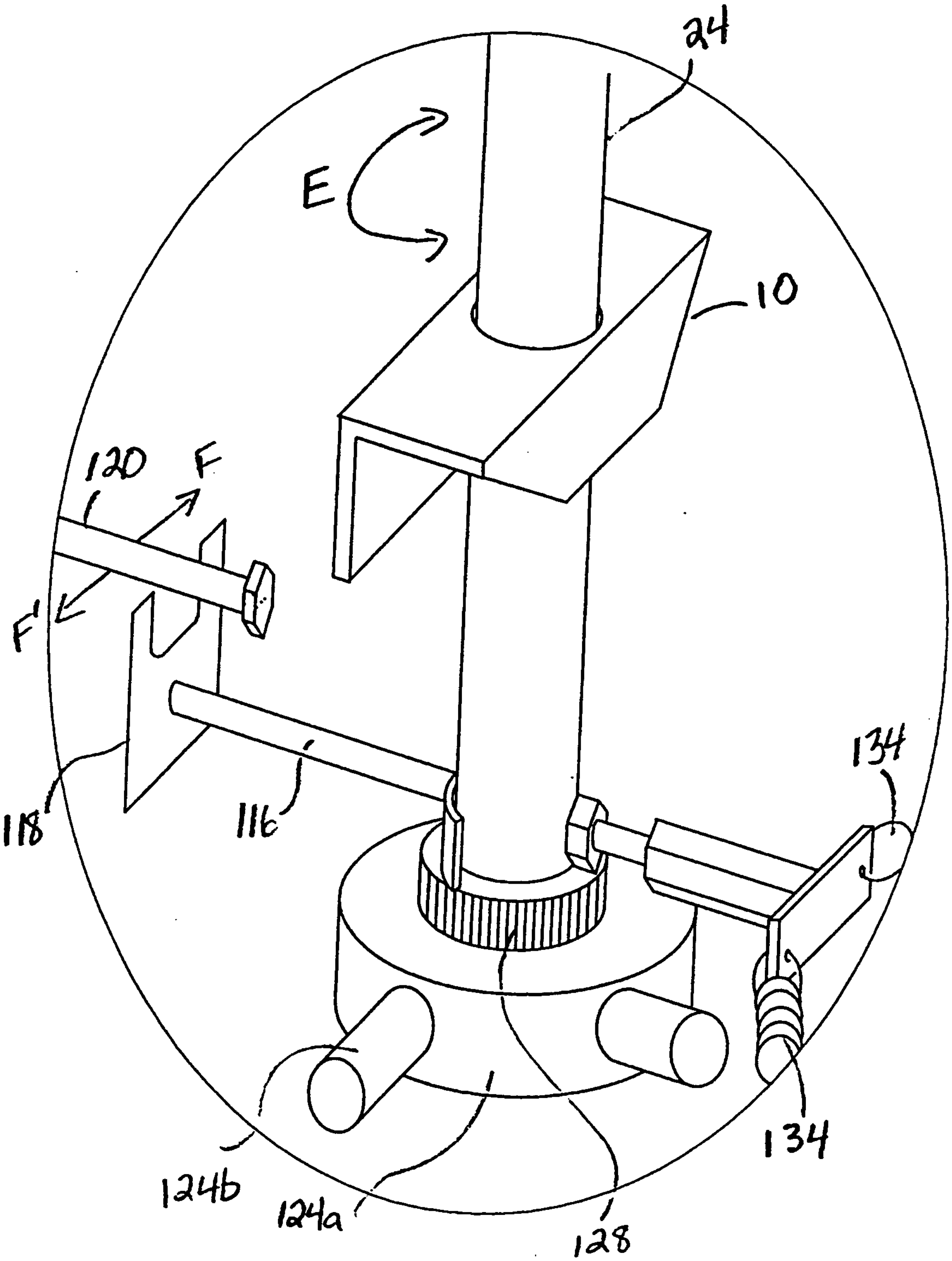

FIG. 7a

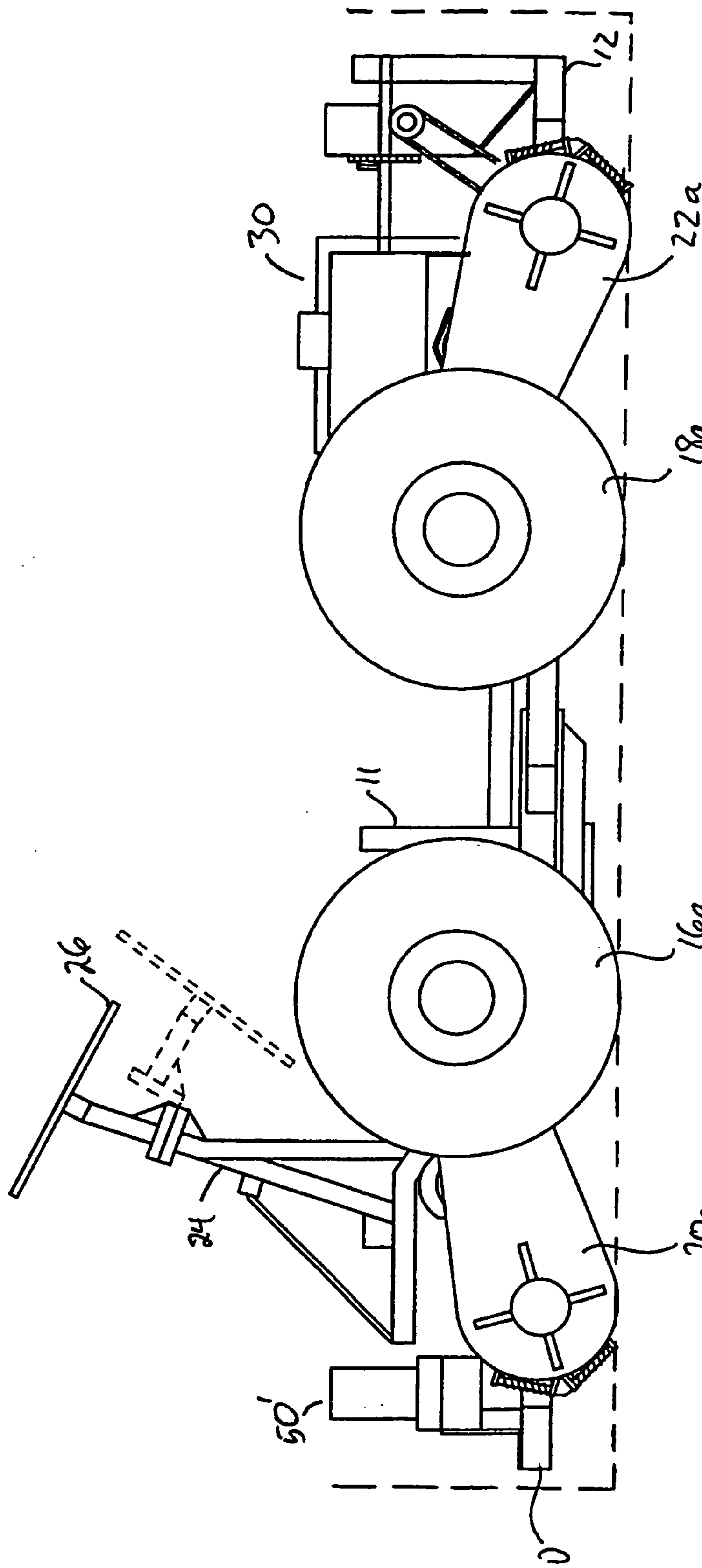

FIG. 8

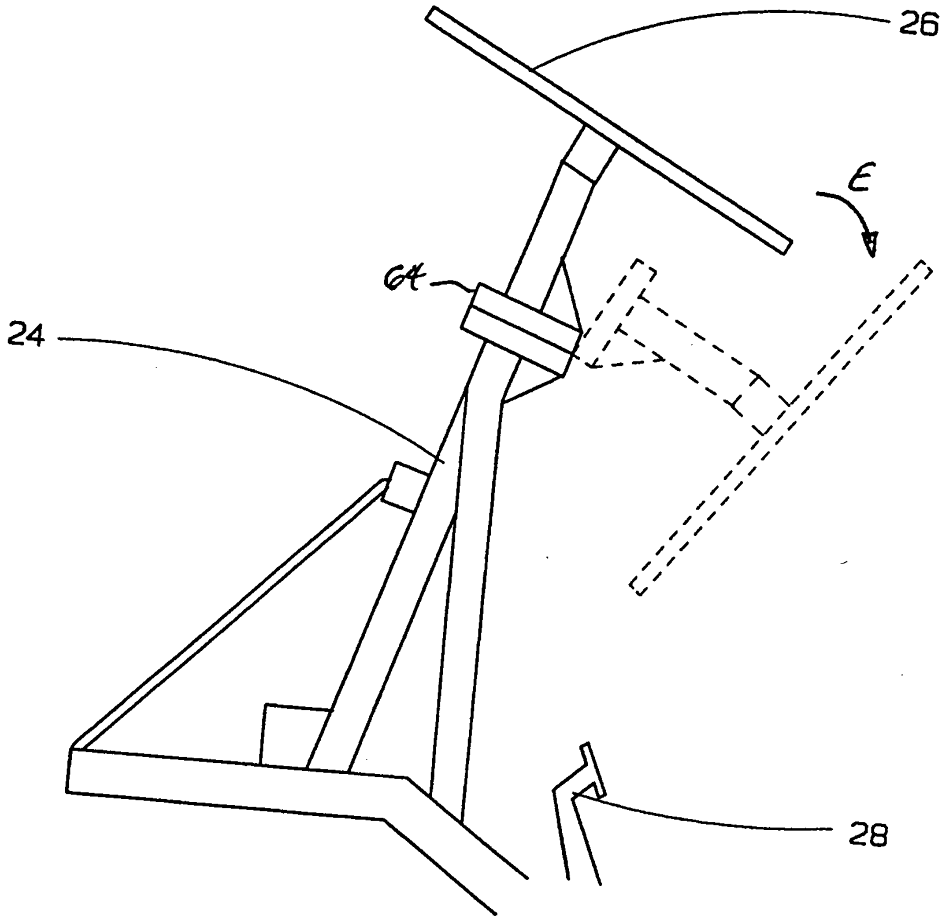

FIG. 9

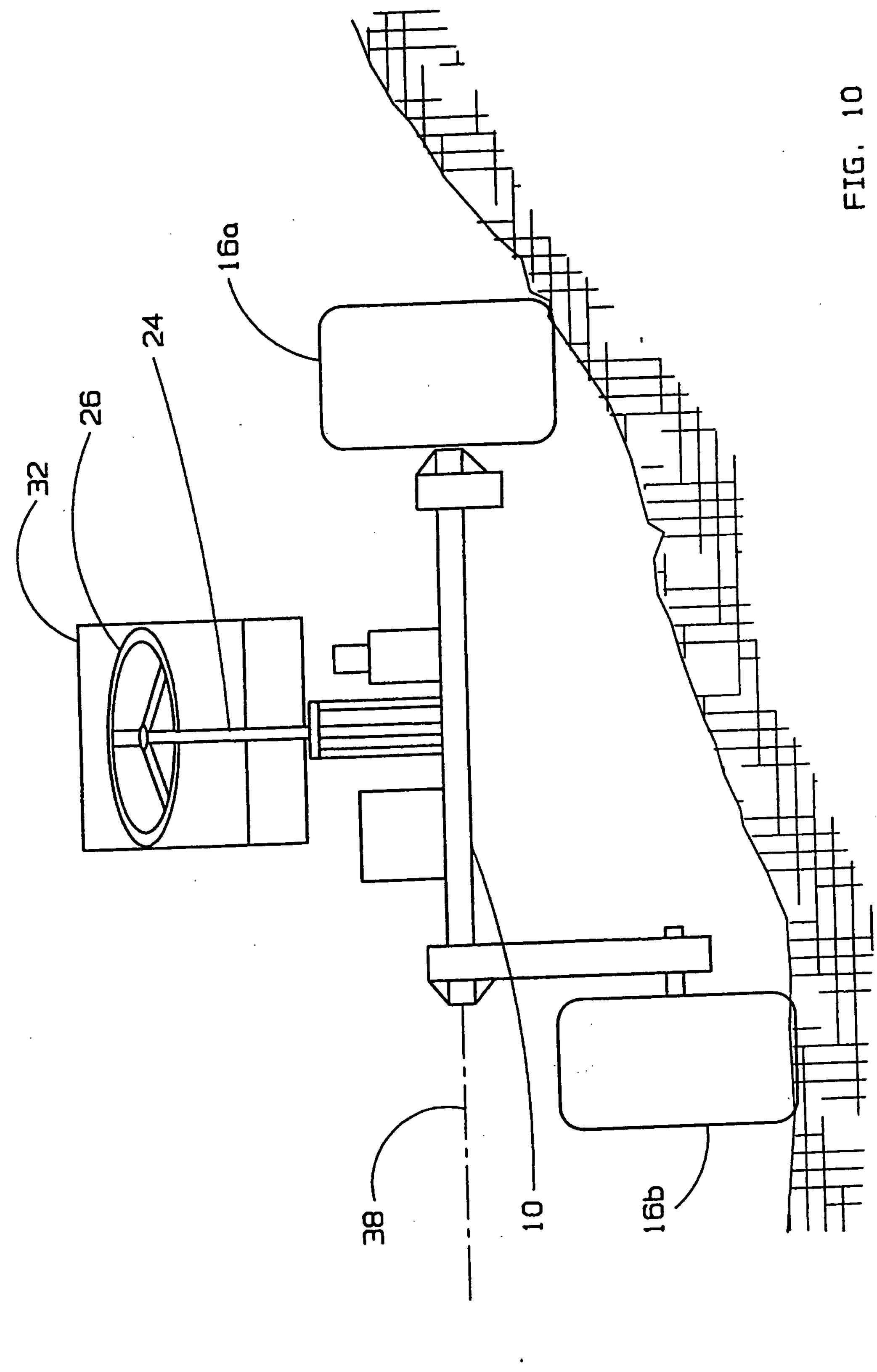

FIG. 10

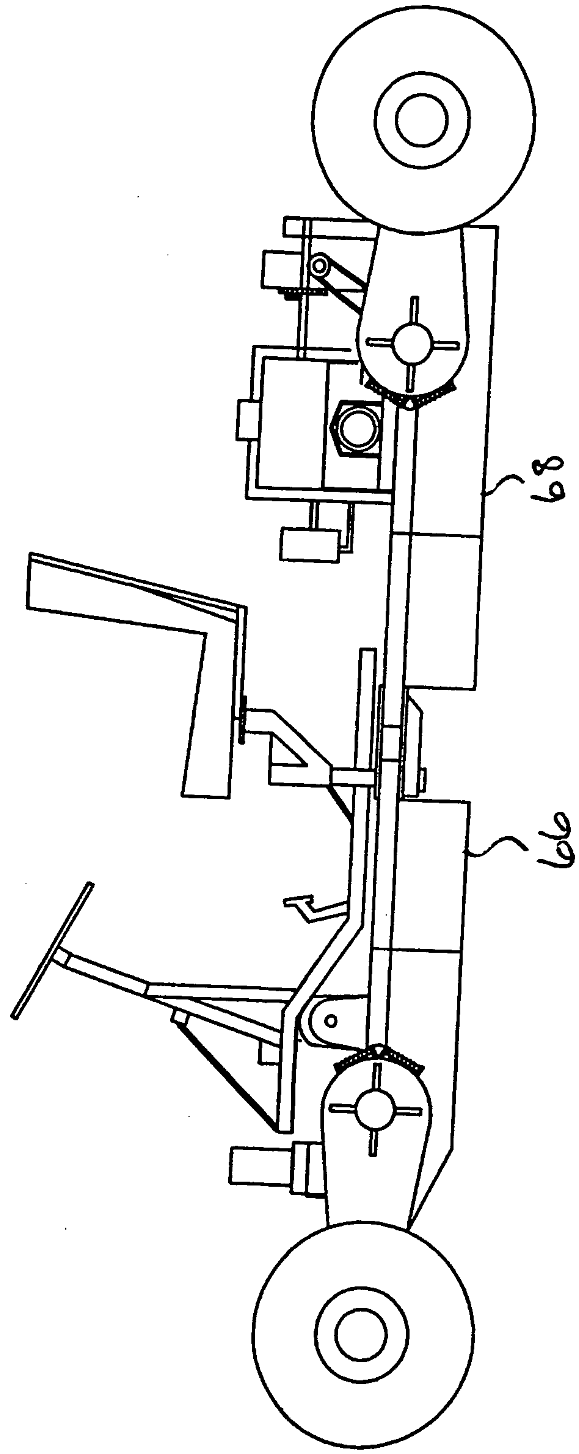

FIG. 11

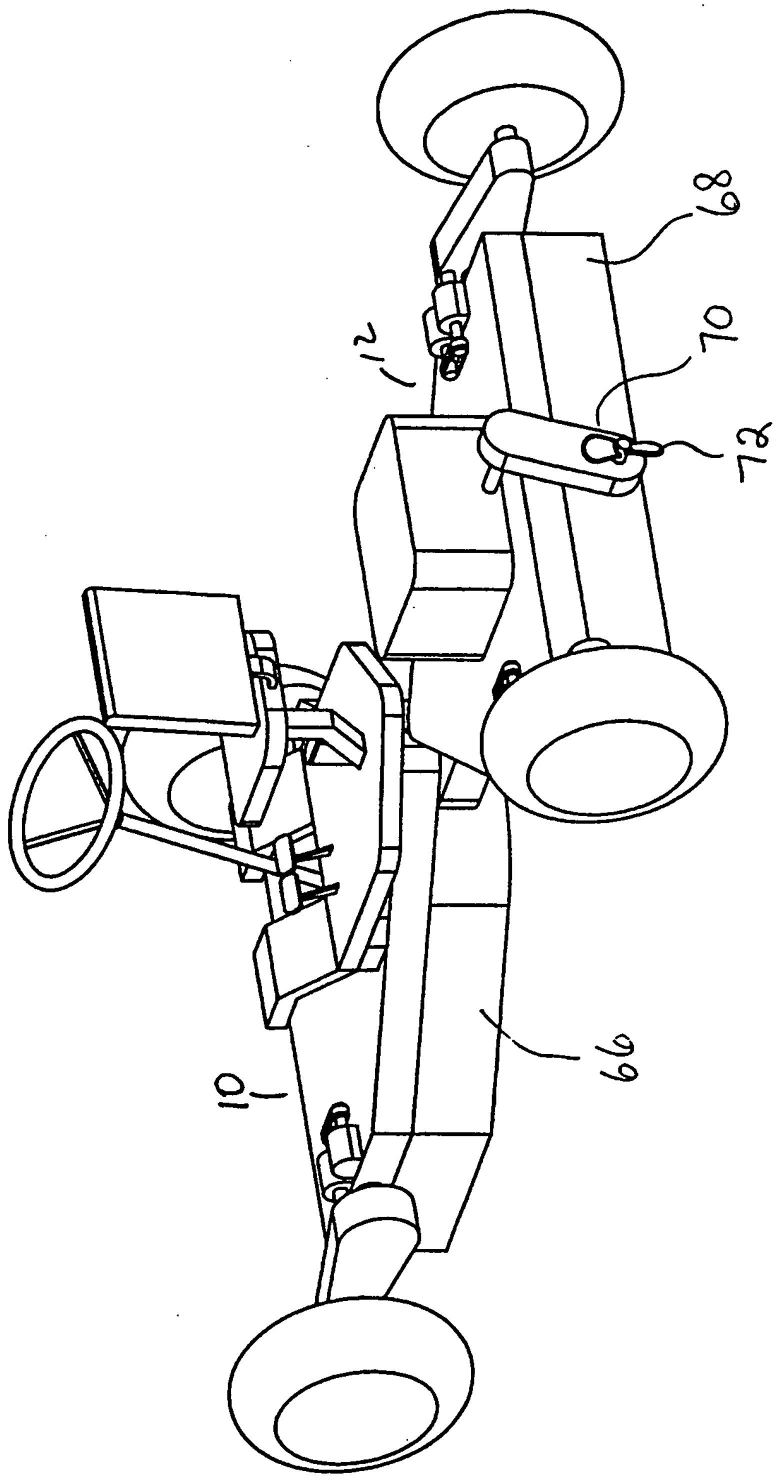

FIG. 12

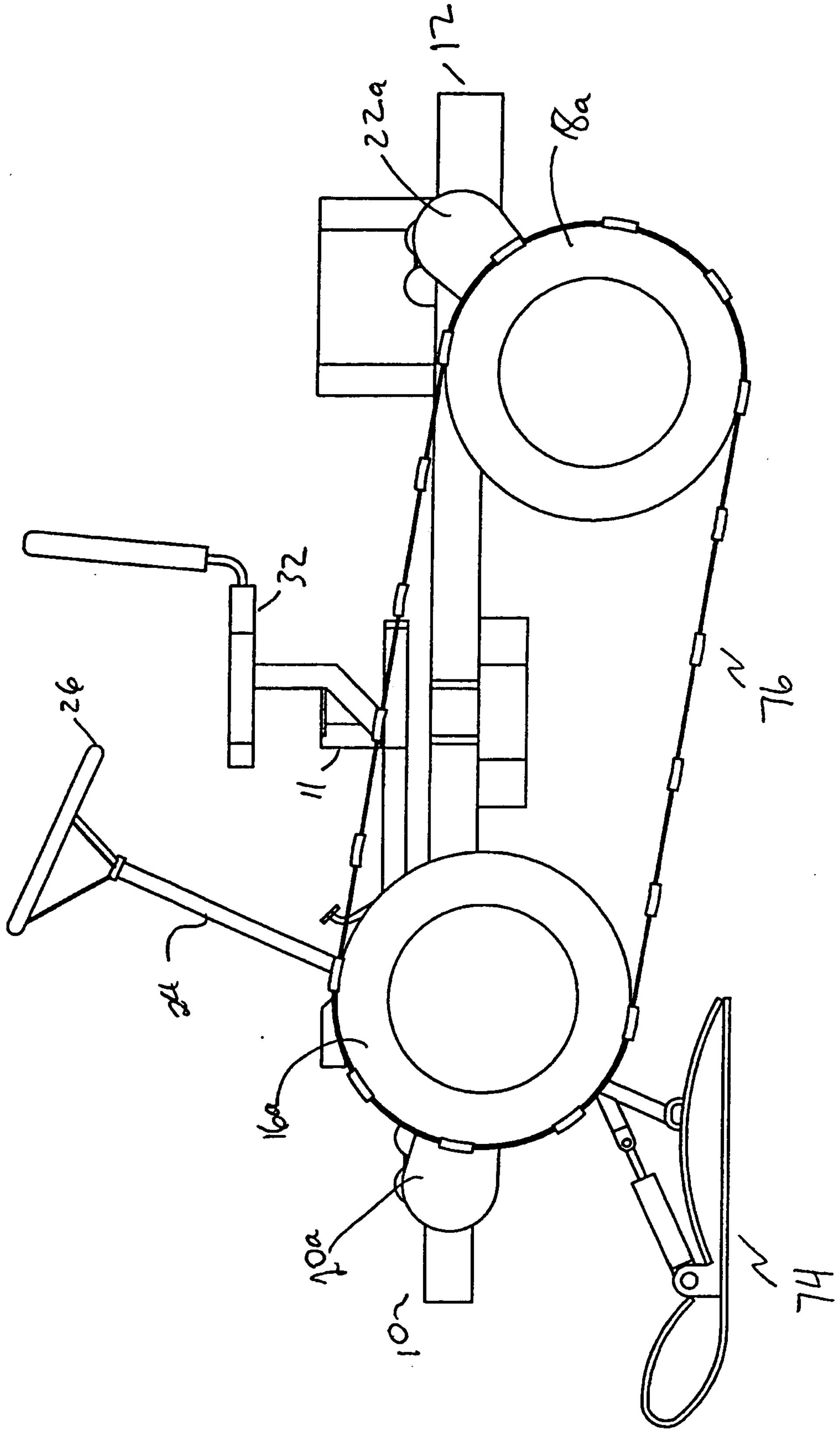

FIG. 13

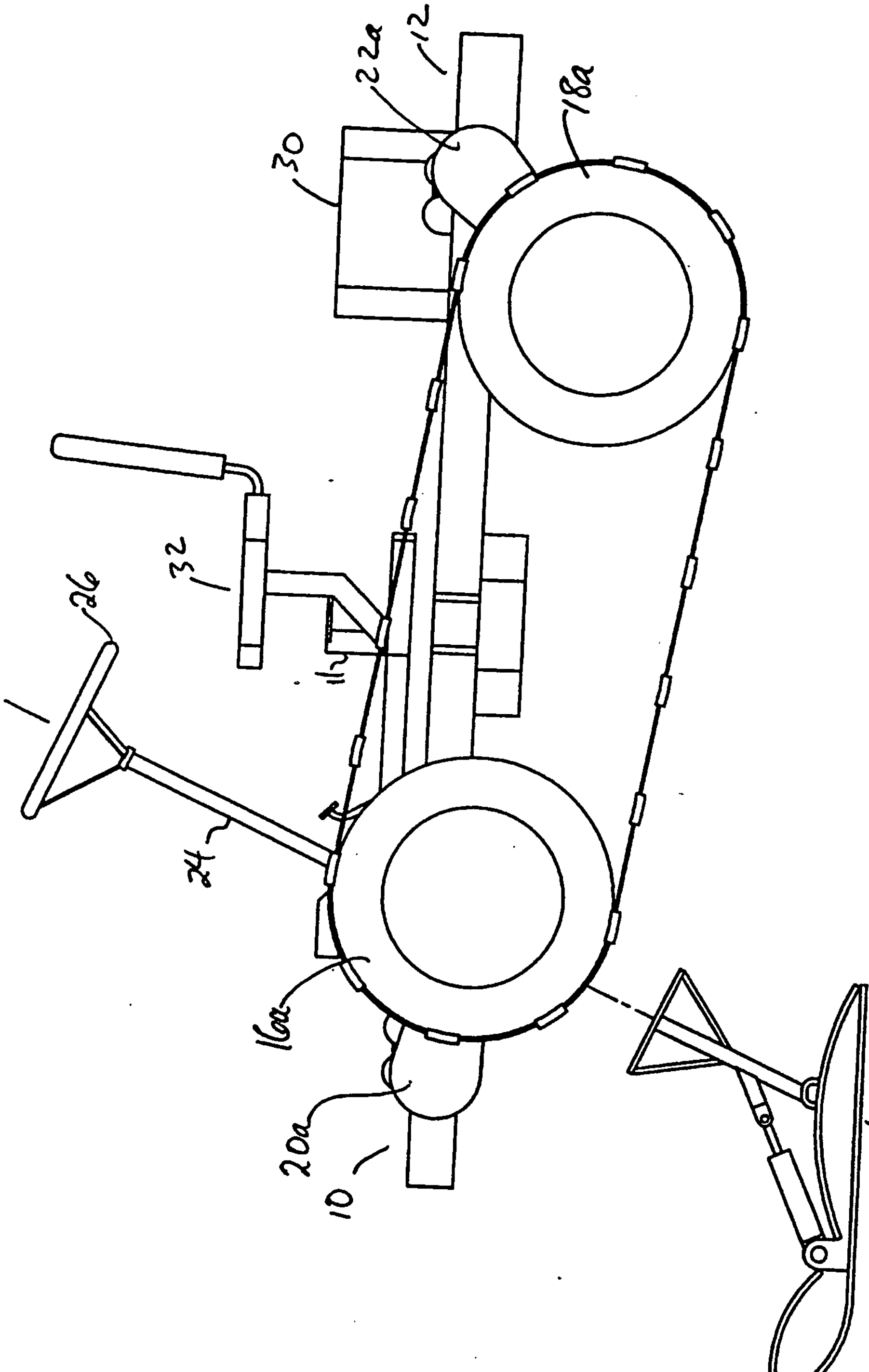

FIG. 14